The speech, below, was prepared for LtGen Ronald Kadish, Director of the Ballistic Missile Defense Organization (BMDO), to be given at the National Defense Industrial Association (NDIA) "Tech Trends 2001: Profiling through Technology Partnerships" conference in Atlantic City, NJ on April 17, 2001. The conference centered on defense technology resident in the four state region encompassing Pennsylvania, New Jersey, Delaware, and Maryland. Featured participants included Congressmen Weldon and Frelinghuysen of Pennsylvania and New Jersey, respectively. Unfortunately, General Kadish was unable to attend. However, Mr. Richard Sokol, BMDO's Chief Architect represented General Kadish and BMDO, and discussed the BMDO technology transfer program. The full speech is presented here.

Panel Remarks By LtGen Ronald Kadish
For the Technology Panel
"Tech Trends 2001: Profiting Through Technology Partnerships"
Atlantic City, April 17, 2001

Thank you for that kind introduction. Congressman Weldon, Congressman Frelinghuysen, distinguished members of the NDIA, and friends. I appreciate the invitation to join you in discussing this important topic of partnerships. I'm pleased to be here with my Service colleagues.

Let me join the choir – commercialization of defense technologies is good. I think all of us in this room recognize that most innovation comes from small firms, labs, and universities, but these institutions aren't necessarily equipped to turn great ideas into successful products. What we in BMDO try to do for those areas of specific interest to BMDO is to help small and startup enterprises with research awards and tech transfer assistance, and then follow through with practical advice on how to make their inventions turn a profit in the commercial marketplace. By passing through the market-driven world of commercialization, where profit margins and volume are typically higher, BMDO also benefits by leveraging commercial sources of money to help bring more affordable and higher performing technologies of specific interest to BMDO to maturity. It truly is a win-win situation.

BMDO, as an acquisition agency, has a family of programs to develop systems that must meet very stringent technical requirements, including the need to defeat long- and short-range missiles and to be interoperable with our allies. BMDO structures its programs to keep pace with the threat, improve system performance, affordability, and producibility, and reduce acquisition program risk. But we couldn't do it without our advanced technology program.

Our technology programs are divided into two broad components.

The first, the **6.3A** level Advanced Technology Development Program for near-term technical requirements, has two central technical challenges it is pursuing – advanced interceptors, using hit-to-kill and directed energy technologies; and advanced sensors, to help us overcome the discrimination challenge.

The second, the **6.2** level program for Applied Research – and of more interest to us this afternoon – focuses on longer-term, innovative technologies. These are typically higher risk, but they also have a potential high pay-off, both for inserting innovations into existing systems and for designing systems to be considered further downstream.

BMDO's approach is to consider simultaneously many technologies as investments toward the next generation of systems. Our future systems are going to need a variety of technologies from a variety of sources that address a variety of needs that may not yet be fully articulated. However, we do know that our next generation systems must be faster, lighter, stronger, more accurate, and less expensive than current ones. Therefore, in making investments into new concepts, novel approaches, and future innovations we consider many technologies. As the program moves into broader areas of missile defense, so, too, our areas of research interest will grow.

Currently, we are particularly interested in these areas:

- Sensing, imaging, ranging, and discrimination

- Phenomenology, including boost phase, hard body handoff
- Electronic and photonic materials
- Information processing and computing technologies
- Directed energy and nonlinear optical devices and processes
- Miniature interceptor technologies and kill enhancement
- Power generation and conditioning

The two programs I'll mention here are the Small Business Innovation Research Program and the Technology Applications Program.

The SBIR Program engages small businesses to advance and commercialize technologies in these areas. I'm sure you're familiar with at least the outlines of this federal program. [Research institutions are covered under the Small Business Tech Transfer (STTR) Program.]

BMDO funds SBIR at about $60 million annually. Should BMDO budget levels increase, our investment in SBIR will correspondingly increase. BMDO solicits innovative ideas through its broad topics solicitation to small high-tech businesses to prove out their ideas. It implements the program in two phases. The first phase grants up to $65,000 over a six-month period to small businesses to flesh out an innovative idea, typically on paper. Then, if further effort is warranted, a second award of up to $750,000 may be granted over a two-year period to produce a demonstration prototype device. However, the company almost always needs more funding than SBIR can provide. Other sources are encouraged, while BMDO SBIR provides the seed-capital to get the high-tech idea started. Since 1997, BMDO's $200 million investment in research has turned into a nearly $400 million series of projects because of co-investment from other sources.

For any technology we fund, whether it be at large or small businesses, research institutions, HBCU/MI, or even Federal labs, then the Technology Applications Program can be of great value. This program is designed to move ideas further down the road toward commercial success and viability. One of our biggest challenges is to nurture and bring to maturity those longer-term technologies identified now but needed later, so that when BMDO does need them, in perhaps 8 to 10 years, they are mature, affordable, and available.

If you are familiar with NASA's Technology Readiness Levels, early-stage R&D typically brings technology to a level of 3 to 5. But for program insertion, weapons systems need technology at a level of no less than 6, and preferably 8 or better. And that is where our program excels. It can help mature technology from a 3-5 up to a 6-8 TRL in the commercial marketplace, using other people's money, and often resulting in a fully capitalized, producible, and improved technology for BMDO.

We've been pretty successful, at least in venture capital terms, in fostering the transformation of promising ideas into commercial products. Our successes have been in tech fields as commercially diverse as biomedicine, electronics, power, optics, sensors, and materials. The variety of products stemming from our past research partnerships and support include computer software, diamond coatings, and quality control devices.

To bring this closer to home, since it started in this four-state area, the SDIO/BMDO SBIR program has provided funding to 45 different firms in Pennsylvania, 42 in Maryland, 41 in New Jersey, and two in Delaware.

Among the success stories is EMCORE Corp., of Somerset, NJ, first funded by the program in 1988. The technology of interest to BMDO is semiconductors, needed for radars, data storage, and high-power electronics. EMCORE found a commercial use in light-emitting diode (LED) lighting – a technology used in cell phones, personal digital assistants, and night-lights – and established a joint venture with GE Lighting. The company went public in March 1997 and has now "graduated" out of the SBIR Program by growing to more than 500 employees. BMDO, for its part, is gaining a maturing technology at substantially lower cost.

Other successes are as noteworthy. AstroPower of Newark, DE, first funded by the program in 1987, went public in February 1998 and has become a world leader in high efficiency solar cell array production. Thermacore, in Lancaster, PA, received SBIR funding for its heat pipe technology. This technology can now be found on every IBM and COMPAQ laptop computer to cool processor chips, and in BMDO for similar purposes. The Brimrose Corporation out of Baltimore, MD, started in the basement of a Savings and Loan building and built, with BMDO SBIR seed funds, a multi-million dollar business that develops sensors for manufacturing and chemical processes.

How do we do this? Ours is a little different approach from the Cooperative Research and Development Agreements (CRADAs) often used by the Services. That's because CRADAs are set up to share costs and benefits of projects in lab setting. BMDO has no labs, and our approach emphasizes mentoring. Our Technologies Application program has three major elements.

The first is a one-day Business Focus Workshop to help entrepreneurs in the early research phases address obstacles to success. These individuals are usually very good at the technology aspects of their ideas, but they may not be very experienced in putting together or strategizing their short and long term plans. This workshop helps them present their ideas, turn those ideas into marketable products, and turn the products into a business.

Following the workshop, the entrepreneur can come back to attend a two-day Technology Applications Review meeting. The purpose here is to help the company that has already developed a working prototype. The focus is on business development, to get advice specific to their situation. The entrepreneurs present their draft commercial strategy to a panel of industry experts/executives and get immediate feedback. But a defining characteristic is that mentoring continues beyond the workshop, and the entrepreneur gets to work individually with experienced hands from the real world of business who volunteer their time. The forum also provides for networking – for making those valuable business and professional contacts so crucial to business success. We were especially fortunate to have Congressman Weldon's participation in one of those BMDO reviews held in late 1999 for companies in the four-state area.

The third aspect of the TA program is outreach – highlighting the results of research to interested audiences. One of biggest hurdles a new company can face is getting the news out. Most companies lack suitable forums, and BMDO can help through multiple platforms with information on abstracts, points of contact, sources, and the like. BMDO has its own web site[1] and a stand-alone Tech Apps web site[2]. Additionally, we have an annual report and several targeted reports on specific applications sent to technology users and developers. Finally, we have the quarterly *BMDO Update* on technology news that is distributed to 7,000 individuals in the field and 1,200 professional media.

The payoff for this outreach can be considerable. For example, the *Wall Street Journal* got news from *BMDO Update* about UTRON, Inc., a company that developed an advanced materials manufacturing technique for low cost, high strength products. *The Journal* ran a front-page story; UTRON got visibility; and the article led to a successful strategic partnership and substantial capital infusion.

Let me close with the thought that BMDO has in place a strategy and a program for technology development that encompasses both our near-term and our far-term objectives. BMDO also understands and supports twin goals of technology development: missile defense and technology competitiveness. We can help you, and you can help us. Let's build on that record of partnership. We look forward to continuing work with you.

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[1]www.acq.osd.mil/bmdo
[2]www.bmdotechnology.net